

THE NAUTILUS.

VOL. XXVI.

MARCH, 1913.

No. 11

COLLECTING IN PANAMA.

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In 1850, C. B. Adams, Professor of Zoology in Amherst College, spent six weeks collecting in the waters of Panama Bay. In 1852, under his own direction, he published a complete catalogue of species collected, with careful notes on synonymy, stations and number of each species taken.

The writer recently spent two weeks covering carefully exactly the same territory, from Old Panama to Taboga Island, about fifteen miles. It may interest the readers of THE NAUTILUS to know what changes in numbers, stations and characteristics may occur in sixty-three years. Many changes have occurred, due probably to disturbed environment. Adams, in six weeks, took 41,835 specimens, 516 species!! Of these there were 38,920 Gasteropoda, 376 species!! In the same season of the year, from the same rocks and sands, with the same tides—eighteen to twenty-four feet—the writer, in two weeks, under most favorable conditions, was able to find only 112 species of Gasteropoda, and about 1000 specimens. Some of these species were not found at all by Adams, who was a careful collector, letting nothing escape him, not even numbers. But the peculiar and interesting fact is that few of the species found in great numbers by Adams are plentiful now, and many of those species are not to be found at all. In many stations other species have taken the place of those found by him.

Adams collected 4500 *Oliva volutella*. These are not there now. Two dead on the beach, and one alive, were all that I found. Of

Oliva porphyria, Adams found only a broken fragment. I hunted in vain for even that. I doubt if Panama is now its natural habitat, as the shell was scarce in 1850 and is not found there now. Adams took 1500 *Nassa panamensis* on the reef that juts out from the old sea wall. Not a single *Nassa* is to be found there now. Of *Nassa luteostoma*, Adams took 330 near the old sea wall. They are not to be found there now, they having migrated two miles across the bay where a bushel could be taken at one tide. Adams found fourteen species of *Nassa*, I found four. Adams found incredible numbers of *Nerita*, two species, took 3200 specimens. Of these only 400 were *Nerita scabricosta*, the only species to be found in considerable numbers now on the high-tide rocks. Adams found 29 species of *Columbella*, 3000 specimens!! Four good specimens of *C. harpaeformis*, brought up by hermit crabs, and half a dozen other species, beach worn, rewarded persistent search.

Monoceros cingulatum. Adams found only 75, most of them young. Of these one may get a thousand adults in one tide—but not at Panama, at Taboga Island. Adams took 3900 specimens of *Litorina*, 12 species. Now, only one species to be found in considerable numbers. Adams found 110 specimens of *Ricinula reeviana*, I found one.

Conus, then and now: *brunneus*, 4—0; *gladiator*, 70—1; *mahoyani*, 17—0; *mix*, 2—12; *princeps*, 8—4; *purpurascens*, 12—1; *regularis*, 1—0; *mus*, 0—25. I was fortunate enough to find two specimens of *Conus panniculus* Lam. at Taboga, one alive, and both splendid specimens. Has this or any other of the *Texti* been recorded from the Panama Province? A fine specimen of *Conus fergusonii* Sby. was found, a species not recorded in the *Conch. Iconica*, and considered doubtful by Tryon. This specimen, after removal of the olive-green, persistent epidermis, shows perpendicular stripes of delicate yellow alternating with lavender, from rounded shoulder to base where the colors merge into pale ashy brown, columella and interior violaceous white. All other specimens that I have seen are dead white. The figure in Tryon's manual is not *C. fergusonii* either in form or color. *Fergusonii* has the rounded shoulder and heavy form of *Conus betulinus* or *C. glaucus*, depressed acuminate spire, whorls eight, rounded and canaliculate.

Purpura seems to be more plentiful than when Adams was there. He found 8 species, 600 specimens. Two miles from Panama one

might take a thousand each of four species in a single tide. These seem to flourish under conditions that have driven other species away. I am unable to recognize many of Adams' species.

Many *Marginellas* dead in the sandy mud, few alive. Adams saw only fragments of *Strombus galea*, easily found now, both young and old. All the *Strombi* attributed to this province are found in good condition but, like other species, washed ashore. They are more plentiful than when Adams was there, but found at Taboga only. *Ranella caelata*, Adams took 190 specimens, alive, at half tide. None alive from high to low tide now. Crabs bring them up in great numbers and good condition.

Adams found *Murex*, 9 species. Found them alive, from half tide to low. Not now. Hermit crabs and diving black boys are the collectors now. Many beautiful and absolutely perfect specimens, too, are washed up dead, to half tide. I found six varieties.

Adams names only one species of *Fusus* (bellus). I took four species at Taboga, two species alive at half tide. Hermits could have furnished a peck. *Cancellaria* about the same but not alive. *Pleurotoma* abundant, but in no such numbers as indicated by Adams. Few alive. *Cerithium*. Adams found 14 species, 3400 specimens!! Half a dozen species now brought up by hermit crabs.

Turritella banksi. Adams took 350 specimens, one-third of them alive. They have gone to deeper water but crabs bring up fine specimens. Adams found 90 specimens of *Pedipes angulatu* under Panama sea wall, and 650 *Auricula panameusis* in same station. Not a specimen of anything to be found there now except *Purpura* in small numbers and *Nerita* out of water. Adams indicated scarcity of *Pecten* and *Pectunculus*. Now most plentiful decoration of the beaches. Adams found *Cypraea cervinella*, *arabacula*, *punctulatis* and *pustulata* on the Panama reefs. Not one of these there now. There is no coral. To be found in small numbers at Taboga where there are small patches of coral to furnish food.

Recapitulating: for four miles either side of the Canal mouth in the Bay all but the coarser, sturdier forms have disappeared. Chitons, *Purpura*, *Siphonaria* and *Fissurella* are there, but few others, and all in small numbers. There is no food on the reefs. Everywhere, in the region covered by Adams, the stations and habits have materially changed. It might be interesting to compare individual specimens of to-day with those of same species taken by Adams

sixty-three years ago. Forces capable of changing habitat and habit might change form and characteristics.

My method in collecting is to traverse the beaches and from dead or broken fragments of shells, observation of tide currents, eddies, and prevailing winds, mark out probable stations at low water or beyond. The method is seldom wrong and leads to live specimens, either for wading or dredging, in shortest time.

Some species in Panama Bay have gone to other stations. Some have disappeared. Nearly all have sought deeper water and stay there.

Very solid volcanic rock, some of it nearly pure iron, is continuous from two miles west of Panama City to Taboga Island, fourteen miles. The Canal runs through part of it, and over the rest of this strata. Heavy dynamite blasts on the main land and on the islands in the Bay where Canal fortifications are to make another Gibraltar, can be felt distinctly at Taboga, too far away to be heard, sometimes. These concussions are frequent, occurring many times a day. A breakwater extends from the mouth of the Canal to the island fortifications. This breakwater is two miles long, and all day long train-loads of dynamited rock are dumped into the waters of the Bay on either side. It is possible that four years of concussion and waters more or less poisoned by nitroglycerene, plus the sewerage of Panama, may have destroyed food and driven the species to new stations, to deeper water, or worse, destroyed many of them. The volcanic reef ends abruptly a mile out and the water suddenly deepens to thousands of feet. At Taboga the conditions are more favorable and there is superb collecting ground, but even there low tide does not expose the live species—to any encouraging extent. The inference that all Panama species near the Canal have sought deeper water is justified.

There is a big suction dredge at Balboa near the mouth of the Canal. This dredge takes up everything from bed rock to top sand and sends a twelve-inch stream of water, mud, and millions of shells (seldom alive), a mile or two inland to make new land. Most of these shells have not been dead long, some are semi-fossil. There is fine collecting at the end of that pipe. But specimens taken there indicate wholesale destruction of molluscan life at the mouth of the Canal.

The most interesting "station" however on the Isthmus is in

Culebra Cut, 150 to 260 feet above mean tide level. There, in squeezed-up marine strata, easily recognizable marine species may be found in considerable numbers. Some are, perhaps, as old as the Tertiary period, but many of them can be duplicated, alive, on the Pacific beaches. Coral is found 262 feet above present mean tide. Fifteen miles away in the Chagres basin marine deposits are also found. Sometime, not so very long ago, there was an open strait where the Isthmus now is. Is the Isthmus younger, very much younger, than scientifically supposed? How much younger? Is there any evidence—not of its age—but of its youth, to be found in the five tons of shell-bearing material sent to Washington by the diggers in Culebra Cut? I don't know. I'm only a gatherer of shells—with an imagination and some disposition to ask questions.

ON SOME CUBAN UROCOPTIDÆ.

BY H. A. PILSBRY.

The following notes relate to new or rare species collected by the writer in 1904. My journey was a rather rapid one, undertaken with the object of seeing something of the mollusk fauna of the central part of the island, as nearly all the Cuban shells I had studied had been taken in the relatively far richer and more frequently explored regions from Havana Province west, and in Santiago Province, or Oriente as it is now called.

My route was from Havana to Cienfuegos by rail, thence to Casilda, the Port of Trinidad, by the Menendez steamship line, thence to Tunas de Zaza on the south coast; by rail then to Sancti Spiritus, eastward to Majagua in Camaguey Province, and return by way of Matanzas. Collecting was done at the places mentioned as well as at many places along the route, and others within a day's journey on foot or mule from those named.

Around Havana, Matanzas, etc., various well-known *Urocoptidæ* were taken which call for no special notice, and also several forms of the *U. elegans* group—a very difficult series, not yet worked up, and extremely abundant in the environs of Matanzas and in Havana Province. *Urocoptis cara* P. & H., *U. longa* P. & H., and the following species may be mentioned among the new forms taken.